

the original neutral gases with a finite decay time. The decay time can be adjusted to enable screens to be refreshed quickly.

[0008] The addressing of the individual pixel is done pretty much the same way it is done for LCD screens. However, since plasma screens have inherent memory characteristics, active matrix addressing, or putting switching transistor(s) behind each pixel, is not needed. This makes plasma displays cheaper to produce than LCD displays for the same screen size, as long as the cost of adding transistors to each pixel is high. The down side is that each plasma pixel can only be turned on or off, so to provide gray scales, PCM (pulse coded modulation) is used to control the brightness of each pixel. However, since plasma displays require a large glass enclosure that can withstand atmospheric pressure, they tend to be a lot heavier and more costly to make, hence once the cost of the drive electronics gets lower as chip technology improves, the overall cost of plasma displays will eventually become higher than that of LCD displays.

[0009] Proper choice of color scintillation agents or phosphors allows a broad chromatic range for plasma displays. In this regard, plasma screens can have a broader chromatic space than that of either CRT or LCD. The contrast is very high for plasma screens since, unlike LCD, which is basically a light valve array, plasma display creates its own light and when it is off, it is completely off. Plasma displays also have very wide viewing angles, especially compared to LCD displays. The main reason is that since plasma screens generate light, no light-robbing polarizers are needed. However, since it would be difficult to manufacture tiny plasma pixels that are less than 0.5 mm in size, plasma display technology is only for big screens. Also, since pulse coded modulation is used for brightness control, some image flickering is unavoidable. Plasma displays also suffer from "burn-in", a phenomenon shared by CRT technology. This is not surprising because both technologies use phosphors to generate light. For the same reason, plasma screens tend to have a shorter life. Finally, compared to LCD screens, plasma displays consumes roughly twice the power of comparable sizes. This can be attributed to the low emission efficiency of the plasma displays, despite having high optical efficiency.

[0010] In spite of the popularity of plasma displays for large screen applications and their current superiority in terms of image quality, it is generally believed that they will be replaced by their LCD counterparts. LCD technologies have advanced at a rapid pace, and LCD panel size as large as 84" diagonal is already in the laboratory. Manufacturers prefer LCD because of the similarity to semiconductor fabrication techniques, whereas plasma screens require large vacuum glass enclosures which still have to be manufactured in the traditional way and does not benefit from Moore's law.

[0011] One of the latest hot entrants to the display arena is the organic light emitting diode displays, or OLED. A pixel of an OLED display sandwiches organic films between two electrodes, a metallic cathode and a transparent anode. The organic films consist of a hole-injection layer, a hole transport layer, an emissive layer, and an electron transport layer. When it is subjected to a potential difference between the two electrodes, the injected hole and electron recombine in the emissive layer to create electroluminescent light. Since

OLED emits light itself, no cumbersome backlight, as in LCD, is needed. OLED can also be vertically stacked for full color displays. It can be manufactured using organic vapor phase deposition technology, and high resolution patterning can be done using ink-jet printing and cold welding to drastically lower production costs. The addressing of the individual OLED pixel is the same as in active matrix LCD. The lack of backlighting device means that the display can be paper thin and can be bended. However, currently OLED technology still suffers from long term stability and durability problems. This is because OLED can not tolerate even the tiniest amount of moisture and/or oxygen and has to be perfectly sealed. Also, the OLED compounds degrade over times, limiting the maximum life of a display. OLED is also not an efficient light emitter. However, since blue, red, and green OLED are available, each pixel of an OLED display can be made of a blue, red, and green OLED, hence no power robbing color filters are needed. Also, since the OLED needs not be turned on whenever a pixel is dark, the average power requirement is usually a lot less than that needed to light up all the OLED diodes on the screen, hence average power consumption of an OLED display is often lower than that of a comparable LCD screen.

[0012] OLED displays use simpler organic compounds for the films. One can also use more complex organic polymers for the films. When polymer films are used, the displays are called PLED. OLED can also be addressed either in an active matrix or passive matrix fashion. Active matrix OLED displays can switch very fast, making them suitable for full motion video. Passive matrix OLED displays require a grid-like stacking and the individual pixels are turned either on or off, making them suitable for text and icon displays in audio and dashboard equipments where low cost manufacturing is the main concern.

[0013] OLED can be brighter, and have broader viewing angles and higher contrast than LCD technology. With an active matrix display driver, it also switches much faster than LCD displays. This, in combination with the fact that the power consumption is proportional to the average pixel gray level value, makes it a better display technology than that of LCD. Moreover, with no backlight, the active matrix OLED display can be extremely thin, less than 2 mm in thickness. So it is possible to have OLED displays that are bendable. Equally important, OLED can be manufactured using inkjet printing technology, potentially making them easier and cheaper to manufacture than their LCD counterparts. The only major drawback is the longevity of the display materials. Currently, because of the manufacturing difficulties, OLED displays are still confined mostly to screen sizes smaller than 10 inches, although larger displays have been demonstrated.

[0014] Another less well known display technology is Iridigm. Each pixel of the Iridigm display has a MEMS (micro-electromechanical system) light switch composed of two conductive plates. One is a thin conducting film stack on a glass substrate, the other is a thin metallic membrane suspended over it. The suspended element has two stable states, when no voltage is applied, the plates are separated by an air gap and the ambient light is reflected or absorbed depending on the wavelength, giving rise to color. By varying the air gap, the color can be changed. When a small voltage is applied, the two plates are pulled together by the electrostatic force and the light is absorbed, turning the pixel